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National Strategy for Invasive Plant Management

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1997



Cover Photo:

A biological desert: this monoculture of perennial pepperweed at Ouray National Wildlife Refuge in northeastern Utah is choking out habitat needed by waterfowl and other wildlife dependent on wetland areas.

Above:

Musk thistle, left unchecked, takes over rangelands and other arid lands throughout much of the West.

(both photos by Steve Dewey, Utah State University)

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RESOLUTION OF ENDORSEMENT AND SUPPORT

The supporters of this National Strategy for Invasive Plant Management agree that the Strategy's goals, objectives, and opportunities provide a conceptual framework of ideas and principles that, if supported and advanced through the individual or cooperative actions of individuals and organizations, will result in the preservation and enhancement of the Nation's croplands, parks, preserves, forests, waterways, wetlands, rangelands, urban green spaces, and their associated uses and industries.

The parties supporting this resolution understand that the Strategy is a nonbinding statement of consensus that recognizes the respective rule-making and administrative authorities of State, Tribal, Federal, and local governments and nongovernment private sector interests. They agree that working within their respective authorities, mandates, and charters, and through development of coordinated and cooperative interorganizational relationships and programs, they can more effectively advance the actions necessary to achieve the Strategy's goals and objectives.

Supporting Organizations:

American Farm Bureau

American Fisheries Society

American Forests

American Sheep Industry Association

American Society of Agronomy

American Society of
Landscape Architects

Aquatic Nuisance Species Task Force

Bowman's Hill Wildflower
Preserve Association, Inc.

Brooklyn Botanic Garden

Burlington Northern
Sante Fe Railroad

California Exotic Pest Plant Council

Calloway's Nursery, Inc.

Colorado Department of Agriculture

Commonwealth of Kentucky
Transportation Cabinet

Connecticut Gardner, The

Conway School of
Landscape Design, Inc.

Crop Science Society of America

DowElanco

Ducks Unlimited Canada

Federal Interagency Committee for
the Management of Noxious and
Exotic Weeds

Florida Department of
Natural Resources

Florida Department of Transportation
Florida Exotic Pest Plant Council

Great Plains Native Plant Society

Intermountain Noxious Weed
Advisory Council

International Association of
Fish and Wildlife Agencies

Izaak Walton League of America

Kentucky State Nature
Preserves Commission

Lilyponds Water Gardens

Louisiana Native Plant Society

Monsanto

Montana Department of Agriculture

Montana Department of
Transportation

Montana Native Plant Society

National Association of Counties

National Association of
State Departments of Agriculture

National Cattlemen's
Beef Association

National Fish and Wildlife Federation

National Forest Foundation

National Parks and
Conservation Association

National Plant Board

National Roadside Vegetation
Management Association

National Watershed Coalition

Natural Areas Association

Native Plant Conservation Initiative

Nature Conservancy, The

Nebraska Weed Control Association

New England Wildflower Society

North American Weed
Management Association

North Carolina Department of
Agriculture

North Dakota Department of
Agriculture

North Dakota Weed Control
Association

Northeastern Weed Science Society

Oregon Department of Agriculture

Oregon Department of
Transportation

Pacific Northwest Exotic
Pest Plant Council

Pennypack Ecological
Restoration Trust

Public Lands Council

Pueblo of Zuni

Rancho Santa Ana Botanic Garden
at Claremont

Rhode Island Natural History Survey

Society for Ecological Restoration

Society for Range Management

Soil Science Society of America

South Dakota Association of County
Weed & Pest Boards

South Dakota Department of
Agriculture

South Dakota Weed
Supervisors Association

Tennessee Exotic Pest Plant Council

University of Michigan
☛ Department of Natural Resources

University of Nevada
☛ Department of Applied
Economics and Statistics

University of Wisconsin
☛ Department of Landscape
Architecture

Utah Department of Transportation

Virginia Native Plant Society

Weed Science Society of America

Western States Land
Commissioners Association

Western Weed Coordinating
Committee

Wilderness Society, The

Wildlife Management Institute

Wildlife Society, The

Wisconsin Department of
Natural Resources

Wisconsin-Madison Arboretum

Woodlanders

Wyoming Department of Agriculture

U.S. Department of Agriculture
☛ Agricultural Marketing Service
☛ Agricultural Research Service
☛ Animal and Plant Health
Inspection Service
☛ Cooperative State Research,
Education and Extension Service
☛ Economic Research Service
☛ Forest Service
☛ Natural Resources Conservation
Service

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☛ Deputy Under Secretary of
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PREFACE

Invasive plants are introduced and then spread throughout the United States without any respect for jurisdiction or property boundaries. This invasion poses a serious threat to the integrity and productivity of our nation's landscape. Dealing successfully with this growing challenge requires the concerted efforts of public land managers and private landowners in every part of the United States.

Of the thousands of introduced plant species established in the United States, 1400 are scientifically recognized as pests. Currently 94 kinds of foreign weeds are officially recognized as Federal Noxious Weeds and many more species are designated on State noxious weed lists. Experts estimate that invasive plants already infest well over 100 million acres and continue to increase by 8 to 20 percent annually. This means 3 million acres, an area twice the size of the state of Delaware, are lost to invasive plants each year. In particular, invasive plants are recognized as a direct threat to agricultural production and biodiversity in the United States. Our croplands, rangelands, forests, parks, preserves, wilderness areas, wildlife refuges and urban spaces all are adversely impacted by invasive plants. The habitat of fully two-thirds of all threatened and endangered species is threatened by invasive species.

Invasive plants have encroached upon millions of acres, in every region of the country, causing billions of dollars in lost

revenue and control costs. In 1993, total direct control costs for noxious weeds were estimated between \$3.6 to \$5.4 billion annually, with an additional \$1 billion in indirect costs. In agricultural production, invasive plants outcompete crops for soil and water resources, reduce crop quality, interfere with harvesting operations, and reduce land values. The estimated annual loss in productivity of 64 crops is \$7.4 billion. On rangelands, invasive plants crowd out more desirable and nutritious forage, cause soil erosion, and poison some wildlife and livestock species. In natural areas, invasive plants reduce habitat for native and endangered species, degrade riparian areas, create fire hazards, and interfere with recreational activities. Aquatic invasive plants clog lakes and waterways and adversely affect fisheries, public water supplies, irrigation, water treatment systems, recreational activities, and shipping.

Any effort to devise a response to this serious national problem must bring together a complex set of interests that includes private landowners, industry, and government agencies at all levels. Fortunately, there are numerous examples of cooperative efforts to control invasive plants based at the local or regional level that bring together the people who have a stake in protecting their lands. The challenge facing us is to create public awareness of this issue and focus public and private resources to implement these models of cooperative action on a scale commensurate to meet this serious invasion.



Leafy spurge is one of many invasive plants wreaking havoc on the economy and ecology of the country. The impacts of leafy spurge cost North Dakota \$75 million a year. (photo by Steve Dewey)

Inset: Sheep eating leafy spurge on a Colorado State University test plot in eastern Colorado.
(photo American Sheep Industry)

INTRODUCTION

Invasive plants, commonly called harmful, noxious or weedy plants, are a serious problem in the United States, causing billions of dollars in damages annually to agricultural, recreational, and tourist industries. These plants severely threaten biodiversity, habitat quality, and ecosystem functions—the very basis of our natural heritage. Invasive plants are growing out of control in our parks, preserves, and refuges, and in our rangelands, forests, agricultural fields, and urban green spaces. Our public natural areas are being lost at an estimated rate of 4,600

acres per day to invasive species. Aquatic invasive plants such as hydrilla and water hyacinth choke our lakes and waterways. Kudzu in the Southeast, purple looses-trife in the Midwest, mile-a-minute vine in the Northeast, and yellow starthistle in the West are just a few examples of the hundreds of invasive plants of foreign origin that have been introduced in this country, accidentally or intentionally, and have since raged out of control.

The National Strategy for Invasive Plant Management outlines a nationwide effort to stem the tide of potentially inva-

The dense mats of hydrilla, an invasive aquatic plant growing in the Potomac River in Washington, DC, snagged this sailboat. Despite strong winds, the boat had to be pulled from the mats. (photo by Dick Hammerschlag)



sive plants arriving in the United States; to control or eradicate those that are already a problem; and to restore full function to our degraded agricultural lands, rangelands, forests, and ecosystems. This Strategy proposes three National Goals: Prevention, Control, and Restoration.

This is a strategic overview; it is not intended to list specific activities that a single organization, interest group, or government agency could or should implement. This is a road map, intended to highlight successful ways to battle invasive plants. Individual organizations or agencies can implement the National Goals that complement their own missions and undertake activities that support the overall national effort.

No single organization, industry, or public agency has all of the information or resources to meet the National Goals. However, there are three approaches that can be used to overcome these deficiencies: Partnerships, Education, and Research. For every objective associated with one of the National Goals, opportunities exist for partnerships to pool

resources for effective, coordinated action; for education to improve the public's awareness of invasive plants and to expand support and compliance with invasive plant control activities; and for research to overcome information gaps and provide new techniques in the management of invasive plants. Some opportunities are included in this strategy, but they are not a complete compilation and should be considered as examples.

The National Strategy for Invasive Plant Management will require a high level of cooperation and collaboration among State and Federal agencies, private organizations, interest groups, corporations, farmers, ranchers, foresters, recreationists, horticulturists, educators, scientists, and individual citizens. Together, these groups and individuals can turn the tide in places where the battle appears lost and prevent further loss or degradation of our lands, waters, and natural resources. The objectives are designed to guide the nation toward the goal of effective invasive plant management.

Partnerships, education, and research are key. Packers and guides can cooperate by using weed-free feed for their pack animals. (photo by Jerry Asher)



NATIONAL GOAL 1

Effective Prevention

The most efficient and cost-effective way to stop the establishment and subsequent damage by invasive plants is to prevent them from becoming a problem in the first place. To do this, foreign invasive plants must be stopped from accidentally or intentionally arriving in this country.

Invasive plants that are already here must be prevented from infesting new areas. Hundreds of invasive plants infest millions of acres of range, forest, wild areas, and croplands in the United States; thousands of potentially invasive species are not yet present in the country.



Purple loosestrife is a problem throughout the country. Strong prevention measures are needed to keep other invaders from becoming this pervasive. (photo by Steve Dewey)

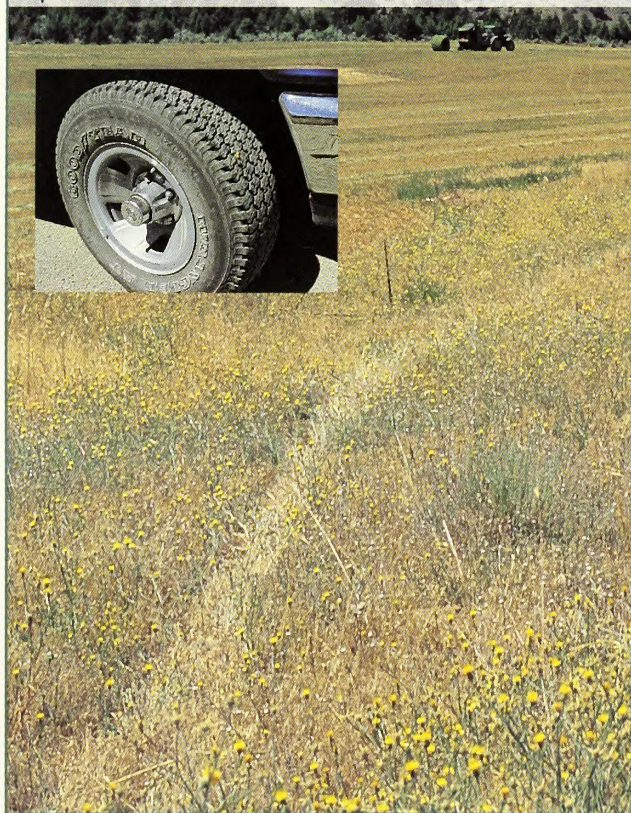
Inset: Purple loosestrife closeup.

Objective 1.1— Preventing New Invasions: Stop invasive plant entry and spread.

It is vital to improve procedures to intercept invasive plants at the border and prevent their spread within the United States. Plants known to be invasive must be prevented from entering the country. Invasive plants already established in the United States must be kept from spreading to uninfested areas. Procedures need to be established to evaluate and mitigate the risk that any plant species proposed for importation may pose.

This infestation of yellow starthistle in eastern Oregon was crossed by a truck, which could spread seeds to new areas. (photo by Elizabeth Reiben)

Inset: Weed seed can attach to tire treads and spread from one area to another.



Opportunities for partnerships: Tourist boards, government agencies, and conservation and industry organizations can pool resources for education and outreach to the public. Land managers can review activities authorized or conducted for their potential to spread invasive plants. Research agencies can share expertise to develop risk assessment tools and commodity screening technologies to minimize the spread of problem species.

Opportunities for education: Foreign and domestic travelers and tourists need to understand how to help prevent the spread of invasive plants into and throughout the United States. Hikers, boaters, hunters, anglers, equestrians, and other users of natural areas need to be informed about outdoor practices that prevent the spread of invasive plants to uninfested areas. Importers of plants and plant materials can evaluate the risk of new introductions becoming invasive.

Opportunities for research: New procedures must be developed to improve inspection of materials at ports of entry or between states that could increase the establishment of invasive plants. Basic ecological studies are needed to determine what conditions make ecosystems vulnerable to plant invasion. Risk assessment procedures are needed to determine the invasive potential of new plants proposed for import. Additional controlled breeding and selection of nonnative plants may be needed to minimize invasive tendencies.

***Objective 1.2—
Detecting and
Monitoring: Expand
and improve systems
for detecting, reporting,
and
monitoring new
infestations of
invasive plants.***

Early detection of new infestations, both of plants known to be invasive and those not known to spread aggressively, will keep eradication and control costs at a minimum. Information is needed regarding initial sightings of new plants with invasive potential and new infestations of recognized problem plants. In addition, a national system for storing and disseminating information about weed occurrences would drastically improve our ability to fight invasive plants.

Post-treatment studies help weed specialists plan for restoration. Here, National Park Service employees assess an area for evidence of Asiatic bittersweet in Virginia. (photo by Rosa Wilson)



Opportunities for partnerships: Establishing a national network among landowners, public land management agencies, recreation groups, conservation organizations, botanists, horticulturists, and weed organizations to report new invasive plant infestations would help meet detection and monitoring objectives. An herbarium or other facility could serve as a central repository for this information, making it available on the Internet, creating a national alert system so that new and spreading plants can be monitored nationally.

Opportunities for education: Schools, conservation groups, weed organizations, outdoor recreation groups, garden clubs, nature centers, and extension programs could help raise public awareness about the effects of invasive plants on lands, waters, wildlife, native vegetation, and agriculture.

Opportunities for research: Effective and standardized invasive plant monitoring protocols are needed. Tools must be developed to assess the invasive potential of recently arrived foreign species. Technologies such as Geographic Information Systems (GIS) and remote sensing need to be adapted so that invasive plant distributions and their potential ecological range in the United States could be located and mapped.

**Objective 1.3—
Complying with Laws
and Regulations:
Provide resources to
ensure compliance with
laws and regulations.**

Coordination of State and Federal laws and regulations would improve control of widespread invasive plants such as kudzu or leafy spurge. Effective regulation of interstate movement of invasive plants will further protect agricultural and natural resource areas and other ecosystems from invasion by new species of plants.

Kudzu kills trees by draping them. Introduction of new invasive plants should be prohibited to avoid additional problems. (photo by Dave Thomas)



Opportunities for partnerships: States with existing invasive plant legislation can coordinate activities between other states and federal agencies to provide adequate enforcement.

Opportunities for education: Concerned citizens, consumer groups, conservation organizations, industry, and our national leaders can be informed about the costs of invasive plants on our food prices, user fees, habitat quality, and biodiversity. They also can be informed about existing Federal and State laws and regulations and the roles of various agencies in responding to invasive plant problems.

Opportunities for research: The full economic impact of invasive plant infestations needs to be determined in order to demonstrate the cost savings associated with preventing new infestations.



A National Park Service resource manager explains to interest group representatives the impacts of nonnative invasive plants on natural resources.

(photo by Rosa Wilson)

**Objective 1.4—
Using Native Species:
Expand use of native
species for ornamental
and conservation
purposes.**

Native plant species provide forage, cover, and habitat required by native fauna. Use of native species for landscaping, rights-of-way, erosion control, and habitat improvement will help prevent the inadvertent spread of nonnative invasive plants and help maintain local biodiversity.



Native species: Rare *Calochortus* only found in Hells Canyon in Idaho. Yellow starthistle (left) threatens this delicate native plant. (photo by Jerry Asher)

Opportunities for partnerships: The demand for native plant nursery stock is increasing, and the nursery industry and others can help develop and expand this national market. State and private nurseries can work with State and Federal conservation agencies to provide stock for native plantings.

Opportunities for education: All plant users need to know about the native plant choices available that will meet their goals. These goals include ornamental planting, rights-of-way, buffer strips, and restoration of natural areas. Native plant conservation groups can work at the “grass-roots” level to stimulate local awareness and interest in native plants.

Opportunities for research: Research is needed to identify the most effective means of seed harvest and propagation for a wide range of native plants. Cleaning methods for removing invasive plant seed from native plant seedlots can be developed so that weed-free certification is feasible. Methods to maintain native plantings, especially during the first few years, must be developed or improved. Additional controlled breeding and selection of native plants may be needed to ensure horticultural value, landscape adaptability, and consumer acceptance.



These native flowers are grown commercially and made available for restoration projects or to individuals interested in growing native wildflowers. (photo by Wendell Hassell)

NATIONAL GOAL 2

Effective Control

Once an invasive plant has become established, it must be kept below economically damaging levels and prevented from spreading to new areas. Like a wildfire, an invasive plant infestation is most easily suppressed or eliminated when it is still

small. After an infestation has greatly expanded, controlling around the edges prevents its further spread, while long-term control efforts should focus on the remainder of the infestation.

Bureau of Land Management and Forest Service employees work with members of The Nature Conservancy to pull yellow starthistle in Idaho. (photo by Jerry Asher)

Inset: Yellow starthistle closeup. (photo by Steve Dewey)



***Objective 2.1—
Planning and
Determining Priorities:
Establish priorities
through areawide
partnership-based
approaches.***

Private landowners, State and Federal land management agencies, weed organizations, and interest groups should establish priorities and coordinate control efforts based on areawide invasive plant management plans.



Revegetation of road cuts with native vegetation in Glacier National Park, Montana, requires detailed planning and cooperation between partners. The National Park Service, the U.S. Department of Transportation and the Natural Resources Conservation Service are working together on this project.

(photo by Wendell Hassell)

Opportunities for partnerships:

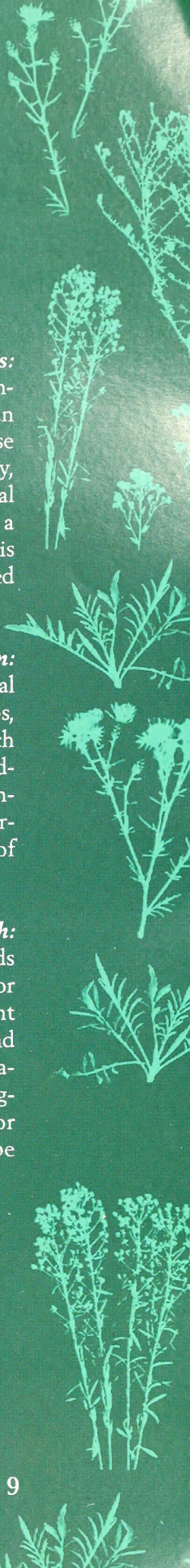
Areawide invasive plant management problems provide an excellent opportunity for diverse interests to work collaboratively, developing mutually beneficial approaches. An example of a successful areawide program is the Greater Yellowstone Weed Management Plan.

Opportunities for education:

Landowners, State and Federal land managers, interest groups, and citizens can learn about each other's specific concerns regarding invasive plants and their control. Each group needs to understand the regional impact of weeds.

Opportunities for research:

Site-specific control methods may need to be developed for high-priority invasive plant infestations. Studies of risks and effects of hydrologic manipulations, prescribed burning, biological control technologies, or chemical applications may be required.



Objective 2.2— Implementing Integrated Pest Management: Practice integrated invasive plant management on an areawide basis.

Integrated invasive plant management relies on a combination of technologies. Cooperation is essential for control when infested areas include several landowners because invasive plants respect no boundaries. Factors to consider in selecting control technologies include compatibility, effectiveness, and environmental effects. Control technologies include biological, mechanical, chemical, and cultural applications. Because of the complexity of environmental, economic, and cultural concerns associated with invasive plant management, programs that are based on a combination of technologies tend to be most successful.



Beetles are used as a biocontrol agent on leafy spurge at Lake Avery near Meeker, Colorado. (photo by Lee Otteni)

Opportunities for partnerships: Invasive plant management can be practiced on a single land parcel in isolation, but resource-sharing and areawide management will lead to more rapid, effective, and long-lasting control. Means should be created for all land managers, including State and Federal agencies, to share resources for integrated weed management.

Opportunities for education: Public land managers and private landowners need to learn the advantages of integrated invasive plant management methods. The general public and private interest groups need to understand the risks and benefits of control technologies proposed for use in their region. Demonstrating integrated invasive plant management practices to the public will hasten acceptance of integrated invasive plant management technologies.

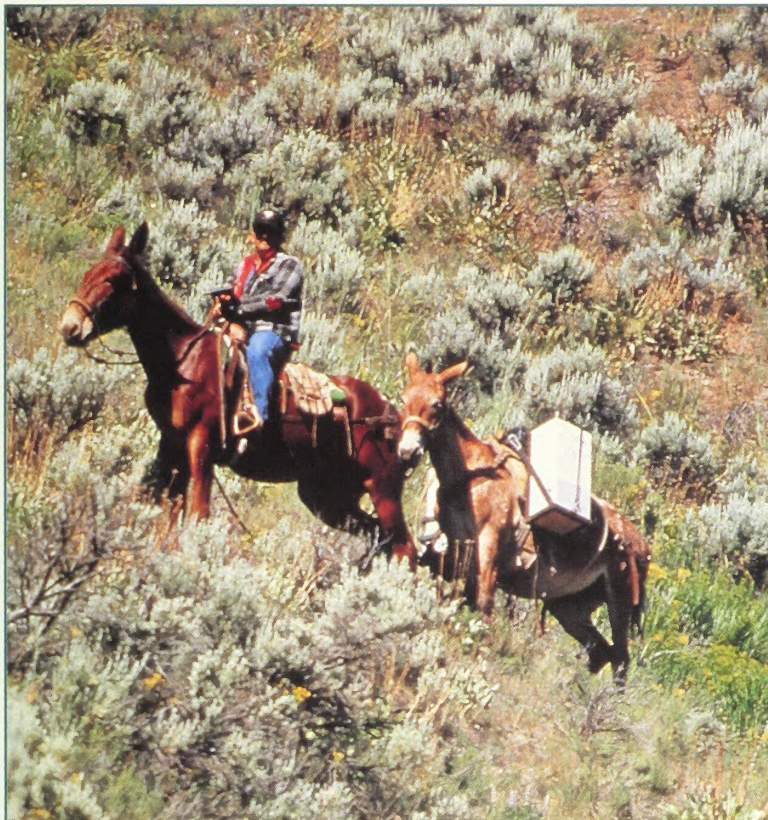
Opportunities for research: Research is needed to identify, evaluate, and clear new biological and chemical controls that are safe, effective, and target-specific. Site-specific studies are needed to determine the best combinations of these controls.



Leafy spurge flea beetle.
(photo by Neal Spencer)

Objective 2.3— Managing Invasive Plants: Eradicate small infestations and contain expansive infestations.

Early eradication of a small infestation will save significant time and money and will be more successful than attempts to eradicate the infestation after it becomes substantial. An expansive infestation should be contained by preventing the edges from advancing, with long-term control efforts, such as biological control, focused on the core.



Mules carry equipment into remote areas to conduct selective spraying. Catching small infestations early is the most effective approach. (photo by Jerry Asher)

Opportunities for partnerships: Regionally based rapid response teams, consisting of landowners, weed specialists, botanists, foresters, and land managers should be established to provide professional assessments and recommendations regarding new weed infestations and support local efforts.

Opportunities for education: Schools, conservation groups, outdoor recreation groups, nature centers, and extension programs can inform the general public about invasive plant impacts. Interest groups and others could sponsor weed roundup activities to eradicate small or newly discovered infestations.

Opportunities for research: Eradication and control technologies for new invasive plants will be needed. Studies are needed to determine what conditions make ecosystems vulnerable to invasion so these conditions can be considered in preventing the spread of invasive plants. For many large invasive plant infestations, more work is needed to identify suitable integrated invasive plant management techniques for use in natural resource areas.



Theodore Roosevelt National Park in North Dakota treats moderate-sized areas of leafy spurge in remote areas to prevent the plant from expanding or spreading.

(photo by Bruce M. Kaye)

NATIONAL GOAL 3

Effective Restoration

Invasive plant infestations displace native plant communities, increase erosion, decrease agricultural productivity, and disrupt ecosystem processes. Restoration or rehabilitation is intended to return the lost components or functions to degraded lands. Restoration is a crucial next step

after invasive plant control or eradication; without it, areas are subject to reinvasion. Native plant communities and ecosystem processes should be restored to natural areas, productive crops to agricultural lands, native forage to rangelands, and healthy understories to forests.

A healthy diversity of native plants and wildflowers will discourage the reinvasion of weeds.



***Objective 3.1—
Formulating Methods
and Procedures:
Develop and implement
effective restoration
methods and
procedures for invasive
plant-degraded areas.***

The practice of restoring degraded lands and maintaining their productivity is relatively new and there is much to learn about how this is best accomplished.

Native plants grown in this greenhouse will be used to restore roadside vegetation after a construction project.
(photo by Wendell Hassell)



Opportunities for partnerships:

Restoration provides excellent opportunities for collaborative demonstration projects. Nurseries, land management agencies, conservation groups, schools, local businesses, recreation groups, weed organizations, and others can work together to eradicate invasive plants and revegetate with appropriate species. Through partnerships, areawide plans to restore missing components or disrupted processes to degraded lands will be feasible.

Opportunities for education:

Informing the public about the benefits of restoring native species, increased agricultural productivity, and natural areas with associated social, economic, and biological benefits will lead to adoption of restoration efforts.

Opportunities for research:

Methods are needed for restoring ecosystem biodiversity and productivity to appropriate levels after invasive plant control and to determine when an area is sufficiently restored and stable. Assessments of the economic, ecological, and social advantages of restoration and maintenance are needed to demonstrate the cost-benefit ratio of efforts to restore ecosystems.

**Objective 3.2—
Promoting Stewardship:
Encourage activities that
help keep lands and
waters free from
invasive plants.**

This objective brings the National Strategy full circle and back to National Goal 1, Prevention. If we can maintain restored lands, we will certainly be making progress. Certain land uses and activities are more likely to contribute to natural environments, and these should be encouraged.



Working together, people can make a difference. This volunteer is pulling spotted knapweed from a recreation site along the Snake River in Idaho before the infestation becomes unmanageable.
(photo by Elizabeth Reiben)

Opportunities for partnerships:

Enterprises in the agriculture and outdoor recreation industries could work with public land management agencies and weed organizations to develop plans for weed-free practices. Private and State nurseries can work with State and Federal conservation agencies to provide materials for revegetation projects. An invasive plant-prevention code of ethics could be developed and adopted by concerned land users.

Opportunities for education:

All land users, including visitors to parks and natural areas, should understand what practices can prevent the spread of invasive plants and be encouraged to apply an invasive plant-prevention code of ethics.

Opportunities for research:

Methods for screening and certifying that pack animal feed is free of weed seed and that "native" wildflower garden mixes contain no nonnative seed content are needed. Additional monitoring of natural areas and better information on the effectiveness of various weed-prevention practices are needed.

More information on the National Strategy for Invasive Plant Management and individuals to contact can be found on the internet at:

<http://bluegoose.arw.r9.fws.gov/ficmnewfiles/NatlweedStrategytoc.html>

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